

$$1) 2^x = 7$$

$$\log_2 7 = x$$

$$\boxed{2.81 = x}$$

$$2) x = u^2 v$$

$$\log x = \log u^2 v$$

$$\boxed{\log x = 2 \log u + \log v}$$

$$3) a) \log 9$$

$$\log 3^2$$

$$2 \log 3$$

$$\boxed{2a}$$

$$b) \log 15$$

$$\log 5 \cdot 3$$

$$\log 5 + \log 3$$

$$\boxed{b + a}$$

$$c) \log 25$$

$$\log 5^2$$

$$2 \log 5$$

$$\boxed{2b}$$

$$d) \log 45$$

$$\log 3^2 \cdot 5$$

$$2 \log 3 + \log 5$$

$$\boxed{2a + b}$$

$$e) \log 225$$

$$\log 3^2 \cdot 5^2$$

$$2 \log 3 + 2 \log 5$$

$$\boxed{2a + 2b}$$

$$4) a) \log_4 x - \log_4 8 = 1$$

$$\log_4 \frac{x}{8} = 1$$

$$4^1 = \frac{x}{8}$$

$$\boxed{32 = x}$$

$$b) 2 \log_5 x - \log_5 5 = \log_5 125$$

$$\log_5 \frac{x^2}{5} = \log_5 125$$

$$\frac{x^2}{5} = 125$$

$$x^2 = 625$$

$$\boxed{x = 25}$$

$$c) \log_5 (x+2) + \log_5 (x-2) = 1$$

$$\log_5 (x+2)(x-2) = 1$$

$$10^1 = (x+2)(x-2)$$

$$10 = x^2 - 4$$

$$0 = x^2 - 14$$

$$x^2 = 14$$

$$x = \pm \sqrt{14} \quad \boxed{+\sqrt{14}}$$

$$d) \log_3 5 + \log_3 x = \log_3 (7+x)$$

$$\log_3 5x = \log_3 (7+x)$$

$$5x = 7+x$$

$$\begin{array}{r} 5x = 7+x \\ -x \quad -x \\ \hline 4x = 7 \end{array}$$

$$4x = 7$$

$$\boxed{x = \frac{7}{4}}$$

$$5) x^{\frac{3}{2}} = 2.36$$

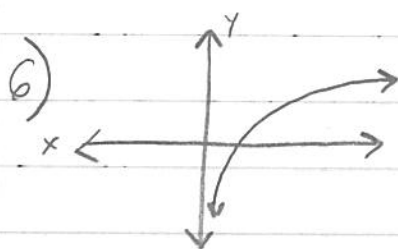
$$\log x^{\frac{3}{2}} = \log 2.36$$

$$\frac{\frac{3}{2} \log x}{\frac{3}{2}} = \frac{\log 2.36}{\frac{3}{2}}$$

$$\log x = .24860$$

$$10^{.24860} = x$$

$$\boxed{x \approx 1.8}$$



$$6b) a) \log_2 x = 6$$

$$2^6 = x$$

$$\boxed{64 = x}$$

$$b) \log_x \frac{1}{5} = -1$$

$$x^{-1} = \frac{1}{5}$$

$$\boxed{x = 5}$$

$$c) x = \log_{10} .0001$$

$$\boxed{x = -4}$$

$$7) \frac{(x^2) \cdot 1 + \frac{(x^2)4}{x} + \frac{3(x^2)}{x^2}}{\frac{(x^2)1 - \frac{9}{x^2}(x^2)}{\frac{100}{x^2}}} = \frac{x^2 + 4x + 3}{x^2 - 9} = \frac{(x+3)(x+1)}{(x+3)(x-3)} = \boxed{\frac{x+1}{x-3}}$$

$$8) \frac{x^3 - 36x}{x^2 + 7x + 6} \cdot \frac{x^2 + x}{6x^2 - x^3} = \frac{x(x+6)(x-6)}{(x+6)(x+1)} \cdot \frac{x(x+1)}{x^2(6-x)} = \boxed{-1}$$

$$9) \frac{\sqrt{3x+1} - 1}{+1} = \frac{x-2}{+1}$$

$$(\sqrt{3x+1})^2 = (x-1)^2$$

$$\frac{3x+1}{-3x-1} = \frac{x^2-2x+1}{-3x-1}$$

$$0 = x^2 - 5x$$

$$0 = x(x-5)$$

$$\frac{x=0}{\text{reject}} \quad \boxed{x=5}$$

$$10) \frac{3x^2 + 4x}{3} = \frac{3}{3}$$

$$x^2 + \frac{4}{3}x + \frac{4}{9} = 1 + \frac{4}{9}$$

$$\left(\frac{4}{3}\right)^2 \quad \left(x + \frac{2}{3}\right)^2 = \frac{13}{9}$$

$$x + \frac{2}{3} = \pm \frac{\sqrt{13}}{3}$$

$$x = \boxed{-\frac{2}{3} \pm \frac{\sqrt{13}}{3}}$$

$$11) \frac{450}{500} = \frac{500 \cdot 10^{-k/10}}{500}$$

$$\frac{9}{10} = 10^{-10k}$$

$$\frac{\log \frac{9}{10}}{-10} = \frac{-10k}{-10}$$

$$k = .00457$$

$$\boxed{k \approx .0046}$$

$$12) \frac{x+5}{x-6} > 2$$

$$2(x-6) = x+5$$

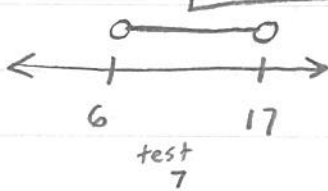
$$\frac{2x-12}{-x} = \frac{x+5}{-x}$$

$$\frac{x-12}{+12} = \frac{5}{+12}$$

$$\boxed{x = 17}$$

$$x-6=0$$

$$\frac{+6}{+6} \quad \boxed{x=6}$$

$$\boxed{(6, 17)}$$


$$\frac{7+5}{7-6} > 2$$

$$\frac{12}{1} > 2$$

yes

$$13) a_1 = 20 \text{ seats}$$

$$n = 20 \text{ rows}$$

$$d = 1$$

$$S_{20} = \frac{20(20+39)}{2}$$

$$S_{20} = \boxed{590 \text{ seats}}$$

Need $a_{20} = a_1 + d(n-1)$
 $= 20 + 1(19)$

$$a_{20} = 39$$

14) 5, 16, 27, 38, 49... Arithmetic Sequence $S_n = \frac{n(a_1 + a_n)}{2}$
 We need " a_{150} "

$$a_{150} = 5 + 11(149)$$

$$S_{150} = \frac{150(5 + 1644)}{2}$$

$$a_{150} = 1644$$

$$S_{150} = \boxed{123675}$$

15) $\sum_{i=1}^5 3i$ $3(1) + 3(2) + 3(3) + 3(4) + 3(5)$
 $3 + 6 + 9 + 12 + 15 = \boxed{45} * \text{Calculator}$

16) $a_n = \frac{2n}{n+1}$ $a_{100} = \frac{2(100)}{100+1} = \boxed{\frac{200}{101}}$

17) $\frac{-20}{a_1} \quad \frac{-16}{a_2} \quad \frac{-12}{a_3} \quad \frac{-8}{a_4} \quad \frac{4}{a_6}$ Common difference
 $7 - 4 = 3$ $4 - -8 = \frac{12}{3} = 4$

$$a_n = -20 + 4(n-1)$$

$$a_n = -20 + 4n - 4$$

$$\boxed{a_n = 4n - 24}$$

$$18) a) A = 32000(1-.15)^t$$

$$b) A = 32000(1-.15)^{10}$$

$$A = 32000(.85)^{10}$$

$$A = 6299.98$$

$$\boxed{A \approx 6300}$$

$$c) 2000 = 32000(1-.15)^t$$

$$\frac{2000}{32000} = \frac{32000(.85)^t}{32000}$$

$$.0625 = .85^t$$

$$\log_{.85} .0625 = t$$

$$\boxed{t \approx 17.06 \text{ years}}$$

$$19) 2, 6, 18, 54$$

Geometric

$$a_7 = 2(3)^{7-1}$$

$$a_7 = 2(3)^6$$

$$\boxed{a_7 = 1458}$$

$$20) 1, -\frac{1}{2}, \frac{1}{4}, -\frac{1}{8}$$

Geometric

multiply by $-\frac{1}{2}$

$$a_8 = 1\left(-\frac{1}{2}\right)^{8-1}$$

$$a_8 = 1\left(-\frac{1}{2}\right)^7$$

$$\boxed{a_8 = -\frac{1}{128}}$$

$$21) -5, 15, -45, 135$$

Geometric $r = -3$

$$S_n = \frac{a_1(1-r^n)}{1-r}$$

$$S_8 = \frac{-5(1-(-3)^8)}{1-(-3)}$$

$$S_8 = \frac{32800}{4} = \boxed{8200}$$

$$22) _, _, 3, _, _, \frac{1}{9}$$

find $r =$

$$\frac{\frac{1}{9}}{3} = \frac{1}{27}$$

Third to sixth term is 3 away

so take the 3rd root

$$\sqrt[3]{\frac{1}{27}} = \frac{1}{3} = r$$

Now use " r " and one of the given terms to find a_1 using

$$a_n = a_1 r^{n-1}$$

$$\begin{matrix} \text{3rd term} \\ \downarrow \\ 3 = a_1 \left(\frac{1}{3}\right)^{3-1} \end{matrix}$$

$$3 = a_1 \left(\frac{1}{3}\right)^2$$

$$\frac{3}{\frac{1}{9}} = \frac{a_1 \left(\frac{1}{9}\right)}{\frac{1}{9}}$$

$$\boxed{27 = a_1}$$

$$23) \quad a_1 = 6 \quad a_n = \frac{1}{2} a_{n-1} + 4$$

$$a_2 = \frac{1}{2}(6) + 4 = 7$$

$$a_3 = \frac{1}{2}(7) + 4 = 7.5$$

$$a_4 = \frac{1}{2}(7.5) + 4 = 7.75$$

$$a_5 = \frac{1}{2}(7.75) + 4 = 7.875$$

$$\boxed{6, 7, 7.5, 7.75, 7.875}$$

$$24) \quad a_1 = 1 \quad a_{n+1} = \frac{a_n + 2}{1 + a_{n-1}}$$

$$a_2 = 2$$

$$a_3 = \frac{a_2 + 2}{1 + a_1} = \frac{2 + 2}{1 + 1} = \frac{4}{2} = 2$$

$$a_4 = \frac{a_3 + 2}{1 + a_2} = \frac{2 + 2}{1 + 2} = \frac{4}{3}$$

$$a_5 = \frac{a_4 + 2}{1 + a_3} = \frac{\frac{4}{3} + 2}{1 + 2} = \frac{\frac{10}{3}}{3} = \frac{10}{9}$$

$$a_6 = \frac{a_5 + 2}{1 + a_4} = \frac{\frac{10}{9} + 2}{1 + \frac{4}{3}} = \frac{\frac{28}{9}}{\frac{7}{3}} = \frac{4}{3}$$

$$1, 2, 2, \boxed{\frac{4}{3}, \frac{10}{9}, \frac{4}{3}}$$

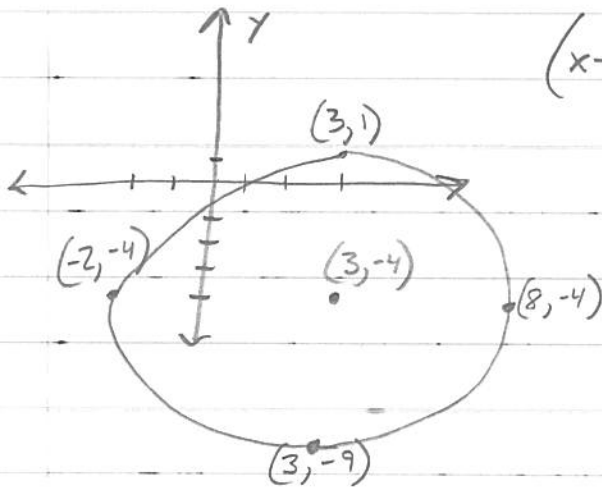
$$25) (x+2)^2 + (y-3)^2 = 10$$

center = $(-2, 3)$ radius = $\sqrt{10}$

$$26) (x-4)^2 + (y-0)^2 = 3^2$$

$$(x-4)^2 + y^2 = 9$$

27)



$$(x-3)^2 + (y+4)^2 = 25$$

$C = (3, -4)$ $r = 5$

$$28) x^2 + y^2 + 4x - 6y - 12 = 0$$

$$x^2 + 4x + \boxed{4} + y^2 - 6y + \boxed{9} = 12 + \boxed{4} + \boxed{9}$$

$$\left(\frac{4}{2}\right)^2 = 4$$

$$\left(\frac{-6}{2}\right)^2 = 9$$

$$x^2 + 4x + 4 + y^2 - 6y + 9 = 25$$

$$(x+2)^2 + (y-3)^2 = 25$$

center = $\boxed{(-2, 3)}$

$$\text{radius} = \sqrt{25} = \boxed{5}$$

$$29) \quad x^2 + 14x + y^2 + 18y = 39$$

$$\left(\frac{14}{2}\right)^2 = 49 \quad \left(\frac{18}{2}\right)^2 = 81$$
$$x^2 + 14x + \boxed{49} + y^2 + 18y + \boxed{81} = 39 + \boxed{49} + \boxed{81}$$

$$x^2 + 14x + 49 + y^2 + 18y + 81 = 169$$

$$(x+7)^2 + (y+9)^2 = 169$$

$$\text{center} = \boxed{(-7, -9)}$$

$$\text{radius} = \sqrt{169} = \boxed{13}$$